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SOIL INVESTIGATION

for the

Improvements to San Tomas Aquino Creek

Santa Clara, California

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Improvements to San Tomas Aquino Creek

Santa Clara, California

Prepared by

William F. Jones, Inc.

Sunnyvale, California

November, 1977

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File: 1/77087/1
Date: 30th November, 1977

Santa Clara Valley Water District
5750 Alamaden Expressway
San Jose, CA. 95118

Attention: Mr. Bruce Wilson, Division Engineer
Subject: Improvements to San Tomas Aquino Creek
Between Bayshore Freeway and the Calabazas Retarding Basin
Santa Clara, California
Project No. 2019 - Agreement No. A0328
SOIL INVESTIGATION

Gentlemen:

Transmitted herewith are 12 copies of our Soil Investigation Report for the proposed improvements to that portion of San Tomas Aquino Creek lying between Bayshore Freeway and the Calabazas Retarding Basin in the City of Santa Clara, California. This work was performed in accordance with your notice to proceed on 29 August 1977.

Our investigation was accomplished in accordance with the program set forth in our proposal of 27 July 1977. Should you have questions regarding any aspect of this report, please contact us at your convenience. We have enjoyed working with your organization on this project, and look foward to providing similar services on future projects.

Very truly yours,
WILLIAM F. JONES, INC.

William M. McMorrow

William M. McMorrow, P.E.

cc: 12 to Santa Clara Valley Water District

File: 1/77087/1

Date: 30th November, 1977

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SOIL INVESTIGATION

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SOIL INVESTIGATION

Introduction

It is proposed by the Santa Clara Valley Water District to undertake flood control improvements to San Tomas Aquino Creek, between the Bayshore Freeway (U.S. 101) and a point northwest of State Route 237 near the Calabazas Retarding Basin in the City of Santa Clara, California. The portion of San Tomas Aquino Creek planned to be constructed flows toward the San Francisco Bay in a southeast to northwest direction, and has a length of approximately 15,000 linear feet.

The proposed construction is planned to provide a controlled flow in the creek within velocity limits that will minimize scouring and undercutting of the channel, and to provide a flow capacity to adequately handle surface runoff waters from the tributary area of the creek for the selected design flood. To accomplish this goal, the existing creek will be cleared of rubble and plant growth, excavated along the channel bottom where required, the channel sides shaped by cutting or placing embankment fill as required, providing slope protection with gabions at selected areas of the project, and raising the elevation of the creek banks by the placement of compacted fill.

The proposed flood control improvements were delineated on two sets of preliminary drawings prepared by the Santa Clara Valley Water District. The first of these was a set of 16 sheets titled "Map and General Plan for San Tomas Aquino Creek from Bayshore Freeway to Calabazas Retarding Basin" dated 20 July 1977. The second set of drawings consisted of seven sheets titled "Cross sections at Soil Borings," undated. The proposed channel measures were further described by District Representatives in meetings held in both the District Offices, and at the project site.

The firm of William F. Jones, Inc. of Sunnyvale, California, was retained to perform a complete Soil Investigation for the project, defined as Santa Clara Valley Water District Project No. 2019. It was intended that the final Soil Investigation would provide needed soil design parameters, and in particular, address the following items:

1. Provide a general description of the subsurface soil profile along the route of the proposed channel improvements.

2. Evaluate the stability of the planned new channel slopes at three selected critical areas, taking into account seepage and seismic force loading conditions.

3. Evaluate the potential for liquification of the channel slopes and the adjacent land mass under seismic loading conditions.

4. Calculate the settlement of the proposed levees under the weight of the proposed fill used to raise the grade of the channel banks.

5. Evaluate whether a requirement exists for filters between the channel banks and the proposed gabions along the southeast part of the project.

6. Evaluate the materials that will be excavated from the channel banks to determine its suitability for use as engineered fill, and estimate the shrinkage/loss factor of the excavated material.

7. Establish guidelines for the character of any required import fill.

8. Submit recommendations for appropriate methods of constructing the proposed channel improvements.

9. Evaluate what effects, if any, seepage from an existing holding

pond and proposed sewage ponds along the channel will have upon the stability of its banks.

In order to obtain sufficient data to address the listed items, a comprehensive program of literature research, field exploration, laboratory testing, and engineering analysis was conducted. Members of our staff in the specialties of soil mechanics, geology, and soil sciences were utilized in our investigation.

Existing Soil Conditions

With few exceptions over the length of the project, San Tomas Aquino Creek is vegetated to some degree on its slopes, and heavily covered with reed growth along its channel bottom. Additionally, portions of the existing slopes contain excessive amounts of rubble, while others have undergone severe undercutting.

Severe undercutting occurs along portions of the east bank of the creek between Bayshore Freeway and approximately 300 feet north of Agnew Road. It should be noted that the undercutting does not occur continuously over the area referenced.

Excessive rubble on the creek banks occurs in the same general area as the undercutting and additionally for the first approximately 200 feet north of Bayshore Freeway on the west bank.

For the most part, the sides of the creek are abutted by relatively vacant land or farmland. The exceptions to this are the Marriot Great America area on the west, a housing development on the east bank of the creek north of Agnew Road, and a Dairy and holding pond on the west that is north of the Old Mountain View - Alviso Road.

Field Exploration

A total of 13 test borings were drilled and sampled along the sides of San Tomas Aquino Creek during the period of 30 August through 7 September 1977, and also on 23 September 1977. It was necessary to break the drilling operation between 7 September and 23 September, as right-of-entry permits for access to the final two borings were not readily available. With the exception of three borings which extended 51.0 feet, the test borings extended 26.0 feet below the existing ground surface. The test borings were located where shown on Figures 1 and 2, "Site Plan and Locations of Test Borings." These figures were prepared from sheets 1 and 2 of the preliminary drawings furnished us by the District, dated 20th July, 1977.

All borings were drilled with CME track-mounted continuous-flight augers, with the exception of the three borings which extended to 51.0 feet below the existing ground surface. These borings were drilled with 8 inch hollow stem augers. The continuous-flight augers drilled a six to eight inch diameter hole in the subsurface soils. Undisturbed soil samples were obtained at selected locations by driving a 3.25 inch O.D. split spoon sampler into the undisturbed soil mass with a 140 pound hammer freely falling 30 inches. The number of blows required to drive the sampler 12 inches into the soil mass was recorded and is shown on the "Logs of Borings", Figures 3 through 13, as "Penetration Resistance." For comparison with commonly accepted standards, the actual field recorded blow counts have been converted to the equivalent number of blows that would be required to drive a Standard Penetration Test sampler (1.375 inch I.D.) 12 inches into the same soils with the same amount of expanded energy. The elevation of the existing ground surface shown on the Logs of Borings were obtained from the cross-sections furnished us by the District.

Disturbed surface and near-surface soil smples were also obtained at selected locations along the creek.

Visual inspection and recording was made of surface disturbed areas that will affect the proposed construction.

Laboratory Testing

Subsequent to the completion of the field exploration phase of our investigation, all retreived samples were examined to verify the field classification. Testing was then scheduled to determine the Plasticity Index and gradation of selected samples to supplement visual classifications.

Additional laboratory testing was performed to determine the in-situ moisture density relationship of the soils, their strength properties, consolidation characteristics, permeability, and remolded behavior.

Following the laboratory testing, proper Unified Soil Classification System designations were assigned the subsurface soils. The results of the laboratory testing are shown on the Logs of Borings, in TABLES I and II and on Figures 16 through 28.

Subsurface Soil Conditions

The upper few feet of soil was generally found to be sandy silts or silty sands, and may have been previously transported to the site as fill. The soils underlying these surface soils are for the most part silty or sandy clays. Random layers of granular materials with varying thicknesses were, however, encountered in most borings. Although stiff layers of materials were encountered within the subsurface soil profiles, for the most part the subsurface clays ranged from soft to medium stiff, and the granular soils in general ranged from loose to medium dense. It should be noted that some of the clays are highly expansive.

Relatively loose granular material at elevations that can affect the grading of the channel bottom and slopes were encountered in Test

Borings 1, 2, 3, 4, 7, 8, and 12. Some lateral movement of these soils is likely when the creek banks are opened, and methods to counteract this movement will be discussed later in this report.

It should also be anticipated that the channel bottom excavation will occur in soft to medium stiff silty clays over a major portion of the project.

Groundwater was encountered in the test borings at depths of 9.5 to 20.0 feet below the existing ground surface.

DISCUSSION AND RECOMMENDATIONS

General

The results of our Soil Investigation indicate that the proposed flood control improvements to the portion of San Tomas Aquino Creek that lies between Bayshore Freeway and the Calabazas Retarding Basin can be constructed in the manner planned.

Because of the physical character of the subsurface soils, the existing erosion along portions of the creek, and the existing and anticipated depth of the groundwater table, it is very important that the recommendations contained in this report be closely adhered to.

Site Preparation

The preparation of the site to allow it to receive the planned improvements will initially require the stripping of rubble, vegetation, and organically contaminated soil from the existing creek banks, and the removal of these items from the project. While the exact depth to which the organically contaminated soil must be stripped from the banks must be based upon visual inspection in the field, it is anticipated that the depth will not exceed 6 inches, exclusive of large areas of

debris which may require significant excavation. Debris and reed growth should be removed from the creek bottom. Any disturbance to the sides or top of the existing banks that will have fill placed over them, or are below design cut grades, must be corrected by back-filling with an acceptable fill material compacted to a minimum relative compaction of 90%.

Following the stripping of organics from the banks, those that are to receive fill should be trimmed back so that they do not exceed a continuous 1.5 Horizontal to 1.0 Vertical gradient. During this shaping phase, all undercut, loose, or badly eroded areas should be removed, and the slopes flattened to the quoted gradient. Where it is not possible to flatten the slopes of the existing banks to 1.5H:1.0V because of boundary limitations, the slopes should be flattened to 1.0H:1.0V and horizontal benches 4 feet in width cut into the banks a vertical distance of 10 feet above the design bottom of channel elevation. This condition should occur at only a very few small areas.

Prior to the placement of any fill, all banks should be inspected for soft areas, excessive water seepage, or flowing sands. Soft areas should be overexcavated and backfilled with select compacted fill. Where there is water seepage or flowing sands, 12 inches of the in-place soils should be removed and replaced with granular material packed in place. For water seepage, the granular material should be well graded between a fine sand and a medium gravel. In the case of the flowing sands, the granular material should be well graded between 0.75 and 1.50 inches in size.

Seepage

The average depth at which groundwater was found in the test borings was approximately 15 feet below the existing ground surface, although the measured depths did range from 9.5 to 20.0 feet. Some of the variation in the depth to groundwater can be attributed to the variances

in height above the surrounding land of the service roads from which the test borings were drilled. Also, the project terrain generally slopes downward from Bayshore Freeway to the Calabazas Retarding Basin.

It is a matter of record that the test borings were drilled in the dry portion of the second consecutive exceedingly dry year in this area. Visual inspection of subsurface samples indicates that the groundwater level has been considerably higher in the past, and may, therefore, be expected to rise somewhat in the future unless the present usage of the surrounding region is drastically altered, or the recent unusually dry weather cycles become the norm of the future.

It is reasonable to assume, based on all known factors, that the ground -water table could rise to a depth of 8.0 feet below the existing ground surface.

With the exception of localized granular layers in the subsurface soil profile, the permeability of the subsurface soils is exceedingly low (see TABLE II) and consequently, even with a rise in the groundwater table, we do not anticipate major seepage problems. Methods of controlling seepage through localized granular layers have been previously discussed. The very low permeability of the fine grained soils will require far more hydraulic head to generate appreciable flow through them than is available. As an example, during our laboratory testing, a constant head permeability test was conducted on a sample of the silty clays. A hydraulic head of 5.5 feet was applied to a 6 inch thick sample for 21 days, and no flow through the sample was effected.

With such low permeabilities, we do not believe that seepage flow sufficient to appreciably affect the stability of the channel slopes can be realized. Similarly, we do not believe the existing holding pond at the north of the project will affect the stability of the channel slopes.

It is possible that localized flow through a coarser granular layer could be of such magnitude that the blanket filter method of controlling the flow would not be adequate. Should this occur, such alternate methods as lateral drains, additional gabion protection, dewatering, or chemical sealing will be required.

Earthwork

The earthwork planned for this project consists primarily of cutting some existing creek banks back to their design slope, using fill to create other slopes, and also using fill to raise the top of the existing service road along the creek to its final design elevation. It is proposed by the District to use as much native material as possible in undertaking the required earthwork.

If the stripping operations effectively remove all debris and significant organic material from the existing creek banks, the excess native soils can be used as engineered fill with the following exceptions:

1. Where localized very soft, highly plastic, expansive , or wet clays are encountered, they must be properly moisture-conditioned before being used for slope construction or wasted.

2. When the bottom of the proposed fill will be under water when placed, a granular material must be used for that portion of fill placed under water.

It is possible that some segregation of materials will occur during bank cutting and stockpiling or placing the generated material. Prior to the placement of these materials as engineered fill, they should be mixed to avoid having areas of exposed cohesionless soil, as some cohesion in the channel slopes is desirable to resist erosion.

The placement of fill at the bottom of the channel will require the initial construction of a working pad to allow the movement of equipment along the channel bottom. The required thickness and compaction of this working pad cannot be accurately predicted as it is a function of the softness of the channel bottom, and the depth of water in the channel at the time the work is in progress. It should, however, be as thin as possible consistent with the ability to obtain a minimum relative compaction in the order of 80% and we anticipate that it will be in the order of 2 to 3 feet thick. Suceeding lifts of fill should have an increasing relative compaction so as to reach a relative compaction of 93% in the shortest distance possible above the channel bottom. Once the 93% relative compaction has been attained, it should be continued to the top of the fill, with the exception of the upper 12 inches of all service roads which should be compacted to no less than 95% relative compaction. The degree of relative compaction attained should be based upon the maximum dry density obtained in laboratory compaction tests performed as established by ASTM D1557-70(c). Compaction should be accomplished at no less than the optimum moisture content.

It is recommended that surface compaction of proposed channel slopes that are formed by cutting back existing creek banks, be performed to attain a relative compaction of not less than 90% for their outer 12 inches. This requirement is intended to seal the slopes, and reduce erosion.

It is recommended that fill slopes be constructed by horizontal, rather than downslope, compaction. This will require some overbuilding of the slopes, followed by a subsequent shaping to the design configuration. We do not believe that adequate uniform compaction in the fill can be attained by compacting downslope. It will be very necessary to provide an integrated contact surface between the existing creek bank and the engineered fill of the proposed slope. If this is not effectively accomplished, seepage forces of a magnitude sufficient to affect the slope stability may occur over an extended time period.

Vibratory compaction equipment should not be allowed on this project.

It is anticipated that a material loss in the order of 25% will occur between cut and compacted fills where native soils are employed as the fill. This does not take into account the volume loss of native soil and rubble removed during stripping operations, or the unpredictable loss by displacement of softer materials that is anticipated during construction of the working pad.

Import fill used on this project should be basically granular in nature, free of rubble, organics and other deleterious materials, have a PI less than 15, and possess 10 to 15% by weight of fines (material passing a #200 sieve) to resist erosion.

Erosion control measures should be initiated as soon as possible after the channel improvements are completed. It is recommended that a granular material be placed over the surface of all service roads. This material should be of the order of 3 inches thick and compacted.

Settlement

Some initial settlement will occur during the construction of filled areas of the channel improvements. Additionally, longterm continuing settlement will occur. The calculated long-term settlements of embankments after the fill is in place are the following:

Fill Height (feet)	Settlement (inches)
2.0	4.0
3.0	4.5
4.0	5.0
5.0	5.5
6.0	6.0
7.0	6.5
8.0	7.0

Fill Height (feet) con't	Settlement (inches) con't
9.0	7.5
10.0	8.0
11.0	8.5
12.0	9.0

The settlements given are based upon the average subsurface soil conditions encountered in the test borings, and are intended for planning purposes only. Variation of settlements along the project will certainly be encountered. It must again be stressed that the initial settlements of filled areas will be dependent upon what materials that are placed, and are unpredictable.

Stability

Stability analyses were made of the slopes at three locations along the proposed channel. These locations were selected as being the most critical areas along the channel, namely in the vicinity of Test Borings No.s 1, 8 and 9. These locations were selected as being critical because of steepness and undercutting af the existing bank, and high embankment fills.

To perform the stability analyses a slip circle failure mode was assumed and saturated, but not buoyant, unit weights were assumed. Seepage forces were deemed negligible. In addition to static forces, a horizontal seismic force equal to 15% of the total weight of the entire slice was applied. Following commonly accepted criteria for this type of construction, it was established that minimum Factors of Safety of 1.50 for static conditions, and 1.10 for seismic loading conditions would provide sufficient stability for the channel slopes.

Our calculations indicated minimum Factors of Safety in the order of 1.70 for static, and 1.25 for seismic loading conditions. No evaluation of any wedge or block type failure was performed, as the scope

of our work did not allow the drilling of additional test borings inland of those drilled at the top of the creek banks. Because of the flat profile of the terrain adjacent to the creek, we do not believe that significantly inclined stratification of the subsurface soils is present.

In our discussions with representatives of the District, the question was raised as to whether or not increasing the back (inland) slope of the embankment to 1.5H:1.0V would reduce the stability of the channel slopes to a less than desired value. Our calculations indicate that an acceptable Factor of Safety will exist at that gradient.

Filters

Gabions approximately 12 inches thick are planned for the protection from erosion of the proposed channel slopes between Bayshore Freeway and Mission College Boulevard. To preclude the migration of the subsurface soils into and/or through the gabions, it will be necessary to provide a filter between the native soils and the gabions. These filters may consist of granular material or filter cloth.

While no specifications were made available to us regarding the composition of the rock fragments within the gabions, it is reasonable to assume that the maximum size fragments will be in the order of 3 to 4 inches. For the most part, the gabions will be placed over cohesive materials. We therefore recommend that if a graded filter is placed between the gabions, it be 24 inches thick, and consist of two 12 inch thick layers of different materials. The filter layer next to the natural soil should consist of well graded material ranging in size from a #100 sieve to 0.5 inches. These sizes mean that the material will vary from a fine sand to a medium gravel. This should be overlain by a 12 inch thick layer of drainrock, well graded from 0.75 to 1.50 inches in size. The material should receive sufficient compaction to approximate a relative compaction of 90%, although an

accurate determination of relative compaction is not possible due to the physical nature of the materials specified.

In lieu of the two-stage graded filter system described, an acceptable filter cloth placed between the gabions and the native soils may be used. Proper filter cloth will allow the passage of water, but preclude the migration of soil into the gabions. While many different filter clothes are commercially available, we believe that one comparable to "Terrafix 300N" manufactured by Kenross-Naue Canada Ltd. will be the most appropriate for use on this project. This product is a synthetic fiber mat that possesses high resistance to rupture when materials such as gabions are placed upon it. It is our understanding that the product is presently manufactured in the United States. No underlying sand or gravel blanket is required beneath the filter cloth.

Seismic Considerations

Our review of published geotechnical data did not reveal the presence of any mapped seismic faults within the project boundaries. Visual inspection along the site did not indicate any characteristic phenomena associated with recent faulting such as sag ponds, spring alignments or vegetation anomolies. There are, however, three active faults located within relatively short distances of the project. These are the San Andreas, Hayward and Calaveras Faults which are located approximately 10 miles southwest, 8 miles northeast, and 13 miles northeast respectively. During any major seismic activity along any of the three faults the area in which the project is located will certainly undergo severe ground shaking. We do not believe that surface rupture, lurching, widespread sand densification or liquefaction will occur.

Test Borings No. 1, 7 and 9 were drilled and sampled to a depth of 51.0 feet below the existing ground primarily to determine whether large deposits of soil that are susceptable to liquefaction or

densification are present within 50 feet of the ground surface along the proposed project. The soil conditions discovered in the three deep borings, and also in the 10 more shallow borings, indicate that while such susceptable soils do exist, they occur in relatively thin layers, and are covered by thick deposits of materials that are not susceptable to liquefaction or densification. We therefore believe, that while small localized liquefaction or densification can occur during major seismic activity, the chances of these phenomena occuring over widespread areas, or the entire project, are remote.

We believe that it will not be feasible to remove the localized areas of soils that could possibly undergo liquefaction or densification during the course of the proposed channel improvements. Rather, we believe that since the channel will be unoccupied, should localized areas incur distress during a major earthquake, its subsequent repair should present no great problem.

SUMMARY

The proposed construction for the San Tomas Aquino Creek appears to be of sound design from a geotechnical viewpoint. The project as designed has adequate calculated factors of safety for both static and seismic loading conditions, with the possible exception of small localized areas which could liquefy or subside during a major seismic event along one of the three nearby active faults.

The charater of the native soils at the bottom of the creek is such that the initial fill placement will require special construction techniques to establish a firm base for subsequent lifts of fill. Once this base is established, the completion of the Channel slopes should be possible with normally utilized construction techniques. The calculated settlements caused by the embankment weights are not excessive.

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Seepage should present no insurmountable problems during the construction period and in subsequent time, provided the recommendations of this report are followed.

LIMITATIONS

The opinions, conclusions and recommendations presented in this report are valid for a period of three years from its date, and have been prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering and soil mechanics. We make no other warranty, either express or implied. The recommendations are based on our own field and laboratory studies, and on a review of applicable published geotechnical documents.

It is neither uncommon to encounter soil conditions during construction which vary from those disclosed in the borings, nor is it practical to determine such variations during a normally acceptable program of drilling and sampling. Such variations, if encountered, frequently require additional engineering services to attain a properly constructed project. If, therefore, variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that defined to us as of the date of this report, notification should be given us so that supplemental services can be undertaken and a re-evaluation of the recommendations prepared. It is suggested that a contingency fund be established to accomodate any additional charges that may result from such additional services.

This report is issued with the understanding that it is your responsibility to ensure the information contained in it is made available to the project engineer, and that the necessary steps are taken to see that the recommendations presented herein are carried out in the field.

Very truly yours,
WILLIAM F. JONES, INC.

William M. McMorrow

William M. McMorrow, P.E.

cc: 12 to Santa Clara Valley Water District

LABORATORY TEST RESULTS

SUMMARY OF STANDARD LABORATORY TEST RESULTS

Hole & Sample No.	Sample Depth Ft.	MATERIAL DESCRIPTION	PHYSICAL CONSTANTS		DIRECT SHEAR		Shear Strength		COMMENTS
			γ_D	W	C	ϕ	Pene. tsf.	Torvane p.s.f.	
1-1	2.0	Silty SAND w/gravel	115.9	10.7			$\geq$ 4.5	1375	
1-2	6.0	Silty CLAY	88.3	27.9			-	2300/2500	PI = 32
1-3	10.0	Sandy CLAY w/gravel	105.3	20.8			-	3500/3600	
1-3	10.5	Sandy CLAY w/gravel	115.2	15.9			3.5/$\geq$4.5	3250	
1-4	15.5	Silty CLAY/Sandy CLAY	103.3	22.0			2.25/3.5	2250/2450	PI = 17
1-5	20.5	Fine Silty SAND	-	-			-	-	
1-6	25.5	CLAY-GRAVEL-SAND	-	-			-	-	
1-7	30.5	Silty CLAY w/fine Sand	105.7	22.6			2.75	2850/3400	
1-8	35.5	Silty CLAY-Sandy CLAY	105.4	20.8			2.75	1200/1360	PI = 6
1-9	40.0	Fine Sandy CLAY-Clayey SAND	111.1	18.2			1.5/3.0	1300	
1-9	40.5	Clayey fine SAND	101.6	23.0			1.3/2.25	1000/1240	
1-10	45.0	Silty CLAY w/traces of Sand	105.3	21.9			1.6/3.6	240/1875	
1-10	45.5	Silty CLAY w/traces of Sand	102.4	22.1			-	2750/3500	
1-11	50.5	Clayey SAND & GRAVEL	117.3	14.7			3.6/4.0	-	
2-1	2.5	Sandy SILT w/gravel	109.2	10.0			$\geq$ 4.5	-	
2-2	3.0	Sandy SILT	112.9	15.5			-	3750/4800	
2-2	5.5	Silty CLAY	96.3	24.9			-	>5000	Specific Gravity = 2.65
2-3	10.0	Sandy CLAY/Silty CLAY	110.7	17.3			4.3/>4.5	2950/3250	
2-3	10.5	fine to med. Silty SAND	103.6	13.4			4.0/>4.5	800/2400	
2-4	15.0	Sandy CLAY/Clayey SAND	102.3	23.6			1.5/1.6	880/1650	
2-4	15.5	Sandy CLAY w/sm. gravels	99.6	25.2	350	17°	-	700/980	
2-5	20.0	Silty CLAY w/traces of Sand	88.4	33.8	350	15°	-	900/1000	
2-5	20.5	Silty CLAY w/traces of Sand	88.5	33.4			1.3	900/920	

SUMMARY OF STANDARD LABORATORY TEST RESULTS

Hole & Sample No.	Sample Depth Ft.	MATERIAL DESCRIPTION	PHYSICAL CONSTANTS		DIRECT SHEAR		Shear Strength		COMMENTS
			γ_D	W	C	ϕ	Pene. tsf.	Torvane p.s.f.	
2-6	25.0	very fine Sandy CLAY	98.9	25.7	250	20°	.75/2.25	900/960	
2-6	25.5	Sandy SILT w/clay binder	102.4	24.1			-	1125/1250	
3-1	2.5	Silty SAND w/sm. gravel	109.3	13.4			>4.5	2500/3600	
3-1	3.0	Silty SAND with gravel	104.3	12.2			4.0/>4.5	2750	
3-2	5.0	Clayey SILT-Silty SAND	95.9	18.2			1.5/2.5	720/1600	
3-2	5.5	Silty CLAY with Silty SAND	89.2	24.6			4.0	3750	
3-3	10.5	Silty CLAY w/traces of Sand	108.7	19.9			3.25	2550/2850	
3-4	15.0	Silty CLAY with gravel	94.5	26.4			-	2650/2950	
3-4	15.5	Silty CLAY with gravel	95.4	24.6			-	2950.3000	
3-5	20.5	very fine Sandy SILT	97.9	25.6			-	-	
3-6	25.0	Silty CLAY with fine Sand	99.3	25.9			1.0/1.5	1500	
3-6	25.5	Silty CLAY	100.2	23.4			-	2350	
4-1	2.5	fine Silty SAND	103.7	9.1			3.25	-	
4-2	3.0	Clayey SILT/Silty SAND	106.0	15.2			>4.5	-	
4-2	5.5	Silty CLAY w/sand & gravel	94.3	22.9			4.25	3500	
4-3	10.5	Sandy CLAY	-	-			-	-	
4-4	11.5	Sandy CLAY w/clayey SAND	98.6	24.3			-	900/1000	
4-4	12.0	Sandy CLAY	98.4	24.0			1.25/1.4	640/780	
4-5	15.5	Sandy CLAY	-	27.2			-	-	
4-6	20.5	Silty CLAY w/sand	97.8	29.2			1.25	660	
4-7	25.0	Silty CLAY w/sand	105.9	21.6			2.2	2700	
4-7	25.5	Silty CLAY w/sand	108.7	19.9			-	>2000/2625	

SOILS NOVEMBER, 1971

SUMMARY OF STANDARD LABORATORY TEST RESULTS

Hole & Sample No.	Sample Depth Ft.	MATERIAL DESCRIPTION	PHYSICAL CONSTANTS		DIRECT SHEAR		Shear Strength		COMMENTS
			γ_D	W	C	ϕ	Pene. tsf.	Torvane p.s.f.	
5-1	2.5	fine Sandy SILT	109.4	14.3			-	3125/3700	
5-1	3.0	fine Sandy SILT	91.1	17.4			-	2800/3500	
5-2	5.5	Sandy CLAY w/organics	90.0	27.4	540	19°	-	750/1560	
5-3	9.5	Silty CLAY	90.7	31.8			-	800	
5-3	10.0	Silty CLAY w/trace of Sand	104.2	21.3			-	1800	
5-3	10.5	Silty CLAY w/trace of Sand	105.7	21.3			-	1260/1720	
5-4	15.5	Silty CLAY	91.2	32.3			-	1780/1840	
5-5	20.0	fine to med. SAND w/binder	104.3	25.2			.5/2.25	-	
5-5	20.5	Silty CLAY	93.7	28.7			2.25	1400	
5-6	25.5	Silty CLAY	109.7	20.0			-	4250.4500	
6-1	2.5	Sandy SILT	104.6	16.4			-	3750/3800	
6-1	3.0	Sandy SILT with gravel	105.5	13.6			-	3900/4000	
6-2	5.0	Silty CLAY	96.7	24.5			-	2000/3900	
6-2	5.5	Silty CLAY	98.1	24.4			-	4000	
6-3	10.5	Silty CLAY	-	-			-	-	
6-4	12.5	Silty CLAY w/sand & clay	93.7	22.4			1.25/1.75	1200/1300	
6-5	15.5	Silty CLAY-Clayey SILT	91.5	31.0	200	30°	-	720/960	
6-6	20.5	Silty CLAY	97.3	28.4			1.0/1.25	900/1250	
6-7	25.5	Silty CLAY with Sand	111.5	19.3			-	>2000/2850	
7-1	3.0	Sandy SILT	108.5	15.5			-	2950/3500	
7-2	5.5	Silty CLAY w/SAND & gravel	111.1	18.8			-	2875/4050	PI = 17
7-3	10.0	Silty CLAY w/sand	97.6	24.7			-	2750	

SOILS NOVEMBER 1971

SUMMARY OF STANDARD LABORATORY TEST RESULTS

Hole & Sample No.	Sample Depth Ft.	MATERIAL DESCRIPTION	PHYSICAL CONSTANTS		DIRECT SHEAR		Shear Strength		COMMENTS
			γ_D	W	C	ϕ	Pene. tsf.	Torvane p.s.f.	
7-3	10.5	Silty CLAY w/slight gravel	103.1	21.0			-	2550/3500	
7-4	15.5	Silty CLAY	-	-			-	-	
7-5	20.5	Silty SAND-Silty CLAY - Sandy CLAY	121.6	20.7			1.0/2.5	>2000	
7-6	25.5	med. SAND w/binder	-	25.9			-	-	
7-7	30.5	Silty CLAY w/sand	110.3	19.4			2.0	2400/3000	
7-8	35.5	Silty CLAY w/sand	93.4	29.1			1.5	1000/1800	
7-9	40.5	Silty CLAY w/traces of Sand	109.8	19.8			-	3550/3600	
7-10	45.5	Silty CLAY w/gravels	108.2	21.2			-	3500/4300	
7-11	50.0	Silty CLAY w/sand	102.6	23.9			1.4/2.0	1750/2250	
7-11	50.5	Silty CLAY	101.7	24.1			1.0/1.25	1250/1500	
8-1	2.5	Sandy SILT with gravel	86.2	28.7			-	560/1900	
8-1	3.0	Silty CLAY with gravel	96.9	14.8			3.0/>4.5	750/2000	
8-2	5.0	Silty CLAY	-	-			-	-	
8-2	5.5	Silty CLAY-Clayey SILT	92.5	14.6			4.2/4.25	1500	
8-3	10.5	Silty CLAY	111.0	18.3			-	4000/4150	
8-4	15.5	Silty SAND	-	16.8			-	-	
8-5	20.5	GRAVEL with binder	-	-			-	-	
8-6	25.5	fine Sandy CLAY	114.7	17.3			1.75	2000	
9-1	2.5	Silty CLAY w/coarse sand & gravel	112.8	15.5			>4.5	3100/4450	
9-1	3.0	Silty CLAY w/coarse sand & gravel	114.0	16.2			-	3650/4500	
9-2	5.0	Silty CLAY	88.0	32.3			2.0	1500/2750	PI = 20
9-2	5.5	Silty CLAY & occ. gravel	95.1	26.6			>4.5	1550/2300	

30th November, 1971

SUMMARY OF STANDARD LABORATORY TEST RESULTS

Hole & Sample No.	Sample Depth Ft.	MATERIAL DESCRIPTION	PHYSICAL CONSTANTS		DIRECT SHEAR		Shear Strength		COMMENTS
			γ_D	W	C	ϕ	Pene. tsf.	Torvane p.s.f.	
9-3	10.0	Silty CLAY	98.9	25.0			-	3000/3300	
9-3	10.5	Silty CLAY	105.6	21.6	.420	30°	3.0	3250	
9-4	15.5	Silty CLAY	-	27.3			-	-	
9-5	20.0	Silty CLAY	88.1	32.7			0/.5	-	
9-5	20.5	Silty CLAY	89.4	34.3	300	14°	.75/1.4	900	
9-6	25.5	fine Sandy CLAY	111.7	19.1			2.75/3.0	2000/3000	PI = 15
9-7	30.5	Silty CLAY with fine Sand	104.3	22.5			1.5	1600/1700	
9-8	35.5	Silty CLAY with fine Sand	107.1	22.1			-	3250/4650	
9-9	40.5	Silty CLAY	111.3	19.3			3.25	3750/4100	
9-10	45.5	Clayey SAND	111.1	21.2			2.35	-	
9-11	50.5	Sandy SILT	115.4	16.9			1.5/2.75	3250	
10-1	3.0	Clayey SAND w/Silty Clay	99.5	18.5			-	3250	
10-2	5.5	Clayey SAND-Silty CLAY	100.5	11.0			>4.5	2750	
10-3	10.5	Silty CLAY	-	-			-	-	
10-4	15.5	Silty CLAY	-	-			-	-	
10-5	20.5	Silty CLAY	-	-			-	-	
10-6	25.5	Silty CLAY	113.8	17.8			-	3000/4000	
11-1	3.0	Silty CLAY	100.0	23.8			-	3000	
11-2	5.5	Silty CLAY	99.7	22.5			-	2000	
11-3	10.5	Silty CLAY	96.0	24.0			-	3000	
11-4	15.0	Silty CLAY	98.5	24.2			-	1250/3500	
11-4	15.5	Silty CLAY	106.1	22.9			-	3350	

SUMMARY OF STANDARD LABORATORY TEST RESULTS

Hole & Sample No.	Sample Depth Ft.	MATERIAL DESCRIPTION	PHYSICAL CONSTANTS		DIRECT SHEAR		Shear Strength		COMMENTS
			γ_D	W	C	ϕ	Pene. tsf.	Torvane p.s.f.	
11-5	20.0	Clayey SAND w/Silty CLAY	99.7	23.1			.5/.75	-	
11-5	20.5	Clayey SAND-SAND	102.5	22.3			1.25/2.3	-	
11-6	25.5	Silty CLAY	112.7	18.6			-	2250	
12-1	3.5	Silty SAND-Silty CLAY-Sandy SILT	88.9	17.3			3.5/5.5	-	
12-2	6.0	Silty CLAY	-	-			-	-	
12-3	11.0	Silty CLAY	91.3	28.6			-	-	
12-4	16.0	Silty CLAY	96.9	28.4			-	2000	
12-5	21.0	Silty CLAY	100.2	28.0			-	900	
12-6	26.0	Clayey SAND	102.6	23.4			.25/.75	500	
13-1	3.0	Silty CLAY	88.3	25.3			-	2400/3000	
13-2	5.5	Silty CLAY	85.4	29.4			-	1250	
13-3	10.0	Silty CLAY-fine clayey SAND	102.1	21.9			-	1250/2750	
13-3	10.5	Silty CLAY w/sand	112.1	15.9			-	1500	
13-4	15.5	Silty CLAY	89.3	30.8			-	2150	
13-5	20.5	Silty CLAY	118.5	30.1			-	1750	
13-6	25.5	Silty CLAY w/very fine Sand	103.0	21.7			-	1250	
			COMPACTION CURVE						
			γ_d max.	ω opt.					
Bag A	0.5-1.5	Silty CLAY w/sand & gravel,brn.	122.5	11.2					
Bag D	0.5-1.5	Sandy CLAY w/gravel, brown	124.5	10.4					
Bag F	0.5-1.5	Sandy SILT, brown	108.7	15.0					

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TABLE II

Summary of Permeability Tests

Sample No.	Material	head in feet	K in in/min
9-3-2	Silty CLAY	5.5'	0
2-2-1	Silty CLAY	(by consol. test)	1.10×10^{-5} @ 500 psf
			2.03×10^{-7} @ 1000 psf
			2.22×10^{-7} @ 2000 psf
			1.88×10^{-7} @ 4000 psf
			7.83×10^{-8} @ 8000 psf

SITE PLAN

and

LOCATION OF TEST BORINGS

(located in back pocket)

LOGS OF TEST BORINGS

AND

PLOTS OF:

LABORATORY CONSOLIDATION CURVES,

GRADATION CURVES, AND COMPACTION CURVES

File: 1///08//1

30th November, 1977

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 27.0 ft.		
	1-1		12	Silty SAND w/traces of gravel, tan, med. dense, moist (SM)	115.9	10.7
				Silty SAND w/slight clay binder & gravel, brown, moist (SM)		
5	1-2		9	Silty CLAY, black, stiff, wet (CL/CH)	88.3	27.9
10	1-3		15	Sandy CLAY w/gravel, mottled grey/tan, stiff, moist (CL)	105.3 115.2	20.8 15.9
				▼ 1030; 31 Aug. '77		
15	1-4		10	Mixed Silty CLAY - Sandy CLAY, mottled brown/grey, stiff, wet (CL)	103.3	22.0
20	1-5		9	Fine Silty SAND, brown, loose, saturated (SM)	-	-
				Fine SAND-GRAVEL mixture, brown, loose, saturated (GW)		
25	1-6		9	CLAY-GRAVEL-SAND mixture, mottled brown/ grey/ medium stiff, loose (GC)	-	-
30						

Figure 3 - Log of Test Boring No. 1

File: 1/77087/1

30th November, 1977

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
				Boring #1 Con't.		
30	1-7		16	Silty CLAY w/fine sand, grey/tan, very stiff, wet (CL)	105.7	22.6
35	1-8		12	Mixed Silty CLAY - Sandy CLAY, wet (CL)	105.4	20.8
				Mixed fine Sandy CLAY-Clayey SAND, moist		
40	1-9		10	Clayey fine SAND w/rust flecking, grey, medium dense, wet (SC)	111.1 101.6	18.2 23.0
45	1-10		18	Silty CLAY w/traces of sand, mottled grey/light grey, very stiff, wet (CL)	105.3 102.4	21.9 22.1
				Coarse SAND-GRAVEL mixture, grey, loose, wet (GW)		
50	1-11		18	Clayey SAND & GRAVEL w/Silty CLAY lenses, grey, med. dense, moist (GC)	117.3	14.3
				Boring Terminated at 51.0 ft. Groundwater Encountered at 14.0 ft. Date Drilled: 30 & 31 Aug. 1977		

Figure 3 - Log of Test Boring No.1 (cont.)

File: 1/77087/1
30th November, 1977

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 24.0 ft.		
				Roadbase		
	2-1		10/6"	Sandy SILT w/gravel, brown, very stiff, damp (SM)	109.2	10.0
			15/6"	Sandy SILT w/organics, dark brown, very stiff, moist (SM)	112.9	15.5
5	2-2		6/6"	Silty CLAY, mottled tan-brown w/black,	96.3	24.9
			10/6"	stiff (CL)		
				Silty CLAY, black, very stiff, wet (CL)		
				Silty CLAY, black (CL)		
				Mixed Sandy CLAY-Silty CLAY, tan/		
10	2-3		9/6"	brown, very stiff, moist (CL)	110.7	17.3
			13/6"	Fine to med. Silty SAND, tan/brown, medium dense, moist (SM)	103.6	13.4
				Mixed Sandy CLAY-Clayey SAND w/organics, w/occasional sm. gravels, mottled tan/ brown, med. stiff, moist (CL-SC)		
15	2-4		7		102.3	23.6
				increasing clay content	99.6	25.2
20	2-5		2/6"	▼ 1 Sept., '77 Silty CLAY w/traces of sand, soft, wet (CL)	88.4	33.8
			3/6"	Silty CLAY w/organics and traces of very fine sand, dark bluish-grey, medium stiff, wet (CL)	88.5	33.4
				Very fine Sandy CLAY w/organics, medium stiff, wet (CL)		
25	2-6		5	very fine Sandy SILT w/clay binder, & organics, med. stiff, wet (SM)	98.9	25.7
					102.4	24.1
				Boring Terminated at 26.0 ft. Groundwater Encountered at 20.0 ft. Date Drilled: 1 Sept. 1977		
30						

Figure 4 - Log of Test Boring No. 2

30th November, 1977

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
				Ground Surface at 23.5 ft.		
0				Roadbase		
	3-1		10	Silty SAND w/sm. occasional gravel, brown, medium dense, moist (SM)	109.3 104.3	13.4 12.2
5	3-2		3/6" 5/6"	(at 5', grading with clay binder) Silty CLAY w/med. silty sand, organic material, black, stiff, wet (CL)	95.9 89.2	18.2 24.6
10	3-3		11	Silty CLAY w/trace of sand, mottled tan-brown/grey, stiff, moist (CL)	108.7	19.9
15	3-4		10	▼ 1015; 2 Sept. '77 Silty CLAY w/occasional gravel and organics, grey, stiff, wet (CL)	94.5 95.4	26.4 24.6
				Silty CLAY w/trace of sand-gravel, grey/brown (CL)		
				Silty GRAVEL, grey, wet (GM)		
20	3-5		7	Very fine Sandy SILT, brown/grey, med. stiff, wet (SM)	97.9	25.6
				Very fine Sandy SILT, grey, medium stiff (SM)		
25	3-6		14	Silty CLAY w/traces of fine sand, mottled grey/brown, stiff, wet (CL)	99.3 100.2	25.9 23.4
				Boring Terminated at 26.0 ft. Groundwater Encountered at 15.0 ft. Date Drilled: 2 Sept. '77		

Figure 5 - Log of Test Boring No. 3

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 19.5 ft.		
				Roadbase		
	4-1		5/6"	Fine Silty SAND, reddish brown, loose, damp (SM)	103.7	9.1
			6/6"	Clayey SILT w/fine to coarse sand and gravel, rust flecking, mottles tan/brown,	106.0	15.2
5			6/6"	stiff, moist (ML)		
	4-2		7/6"	Silty CLAY w/trace of sand and gravel, roots, black/brown, stiff, wet (CL)	94.3	22.9
				Sandy CLAY w/clayey sand lenses and organics, wet (CL)		
10	4-3		6	(at 10' becoming mottled tan/brown)		
	4-4		4		98.6 98.4	24.3 24.0
15	4-5		5	▼ 1300; 2 Sept. '77	-	27.2
20	4-6		4	Silty CLAY w/sand, bluish-grey, soft, wet (CL)	97.8	29.2
25	4-7		17	Silty CLAY w/sand, grey-brown, very stiff, wet (CL)	105.9 108.7	21.6 19.9
30				Boring Terminated at 26.0 ft. Groundwater Encountered at 15.0 ft. Date Drilled: 2 Sept. 1977		

Figure 6 - Log of Test Boring No. 4

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 17.0 ft.		
				Roadbase		
				Mixed Silty CLAY-Clayey SILT, reddish brown, moist (CL/ML)		
	5-1		9	Fine Sandy SILT, mottled red/brown, stiff, moist (SM)	109.4 91.1	14.3 17.4
5	5-2		4	Sandy CLAY w/heavy organics, rust flecking mottled grey, soft to medium stiff, wet (CL)	90.0	27.4
				Sandy GRAVEL w/binder, black/brown, wet (GP)		
10	5-3		7	Silty CLAY w/trace of sand & organics, bluish grey, med. stiff, wet (CL)	90.7	31.8
				Silty CLAY w/trace of gravel, brown/tan medium stiff, wet (CL)	104.2	21.3
				▼ 1530; 2 Sept. '77	105.7	21.3
15	5-4		7	Silty CLAY w/organics, rust flecking, med. stiff, wet (CL)	91.2	32.3
20	5-5		8	Mixed fine to med. SAND w/binder-Silty CLAY, grey/brown, med. stiff to stiff, wet (SW-CL)	104.3 93.7	25.3 28.7
25	5-6		17	Silty CLAY w/occ. gravel, tan/brown, very stiff, moist (CL)	109.7	20.0
				Boring Terminated at 26.0 ft. Groundwater Encountered at 12.5 ft. Date Drilled: 2 Sept. 1977		
30						

Figure 7 - Log of Test Boring No. 5

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
				Ground Surface at 16.5 ft.		
0				Roadbase		
				Sandy SILT w/gravel, brown, moist (SM)		
				Sandy SILT, brown, stiff, moist (SM)		
	6-1		6/6"		104.6	16.4
			8/6"	Sandy SILT w/gravel, brown, very stiff, moist (SM)	105.5	13.6
			5/6"	Silty CLAY w/organics, black/brown, stiff,	96.7	24.5
5	6-2		8/6"	wet (CL)	98.1	24.4
				Silty CLAY w/organics, brown, stiff, wet (CL)		
10	6-3		8	(at 10', mottled tan/brown, medium stiff)	-	-
			3/6"			
	6-4		4/6"	Silty CLAY w/Sandy CLAY lenses, mottled brown/tan /orange, medium stiff, wet	93.7	22.4
				▼ 1010;6 Sept. '77 (CL)		
15	6-5		4	Mixed Silty CLAY-Clayey SILT, soft, wet (CL-ML)	91.5	31.0
20	6-6		6	Silty CLAY, brown/grey, medium stiff, wet (CL)	97.3	28.4
25	6-7		12		111.5	19.3
				Boring Terminated at 26.0 ft. Groundwater Encountered at 13.5 ft. Date Drilled: 6 Sept. 1977		
30						

Figure 8 - Log of Test Boring No. 6

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 17.0 ft.		
				Roadbase		
				Silty SAND w/gravel, brown (SM)		
	7-1		13	Sandy SILT mixed with Silty CLAY, brown, stiff, moist (SM)	108.5	15.5
5	7-2		11	Silty CLAY with sand & gravel, mottled brown, stiff, moist (CL)	111.1	18.8
10	7-3		11	Silty CLAY, traces of sand, and gravel lenses, dark brown, stiff, wet (CL)	97.6 103.1	24.7 21.0
				becoming mottled brown		
15	7-4		6	drilling stiffer	-	-
				▼ 1550; 31 Aug. '77		
20	7-5		9	SAND-CLAY mixture, stiff, wet (SC)	121.6	20.7
				Medium SAND with slight clay binder, med. dense, wet (SP)		
25	7-6		11		-	25.9
				increasing clay content (SP)		
30						

Figure 9 - Log of Test Boring No. 7

File: 1/77087/1

30th November, 1977

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
				Boring #7 con't		
30	7-7		11	medium SAND w/binder (SP) Silty CLAY w/sand, brown, stiff, moist (CL)	110.3	19.4
35	7-8		9	(at 35 feet, mottled tan/brown, stiff, wet)	93.4	29.1
40	7-9		13	(at 40 feet, traces of sand)	109.8	19.8
45	7-10		21	(at 45 feet, traces of gravel)	108.2	21.2
50	7-11		13	(at 50 feet, brown, traces of sand)	102.6 101.7	23.9 24.1
				Boring Terminated at 51.0 ft. Groundwater Encountered at 17.5 ft. Date Drilled: 31 Aug. 1977		

Figure 9 - Log of Test Boring No. 7 (cont)

30th November, 1977

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 14.0 ft.		
				Roadbase		
	8-1		5	Sandy SILT w/gravel, reddish brown, med. stiff, moist (SM)	86.2 96.9	28.7 14.8
5	8-2		5	Silty CLAY w/occ. gravel, brown, medium stiff, moist (CL)	92.5	14.6
				Mixed Silty CLAY-Clayey SILT, black/ brown, medium stiff, moist (CL-ML)		
10	8-3		15	Silty CLAY/trace sand, grey/tan-brown, stiff, moist (CL)	111.0	18.3
				CLAY-GRAVEL mixture, grey/tan, wet 1230; 6 Sept. '77 (GC)		
15	8-4		9	Silty SAND, tan/brown, loose, moist (SM)	-	16.8
				GRAVEL w/binder, tan/brown, wet (GM)		
20	8-5				-	-
				Sandy CLAY		
				decreasing sand content (CL)		
25	8-6		12	Fine Sandy CLAY, tan/brown /orange, stiff, moist (CL)	114.7	17.3
				Boring Terminated at 26.0 ft. Groundwater Encountered at 13.75 ft. Date Drilled: 6 Sept. 1977		
30						

Figure 10 - Log of Test Boring No. 8

File: 1/77087/1

30th November, 1977

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 10.0 ft.		
				Roadbase		
				Clayey SILT w/occ. gravel, brown, moist (SM)		
	9-1		8/6"	Silty CLAY w/coarse sand & gravel, brown,	112.8	15.5
			9/6"	stiff, moist (CL)	114.0	16.2
				Silty CLAY w/coarse sand & gravel, blue-grey, very stiff, moist (CL)		
5	9-2		5/6"	Silty CLAY w/heavy organics, dk. grey, stiff, wet (CL)	88.0	32.3
			7/6"	Silty CLAY w/heavy organics & occ. gravel, black/grey, stiff, wet (CL)	95.1	26.6
10	9-3		7/6"	Silty CLAY, grey/brown, stiff, wet (CL)	98.9	25.0
			10/6"		105.6	21.6
				Silty CLAY w/trace sand, mottled tan/brown, very stiff, wet (CL)		
				▼ 1000; 1 Sept. '77		
				encountered sand lense		
15	9-4		7	increasing sand content	-	27.3
				increasing moisture		
20	9-5		5	Silty CLAY w/heavy organics, mottled grey/ tan, medium stiff, wet (CL)	88.1	32.7
					89.4	34.3
25	9-6		16	Fine Sandy CLAY, tan/brown, very stiff, moist (CL)	111.7	19.1
				Silty CLAY w/fine sand, mottled grey/ brown, stiff, wet (CL)		
30						

Figure 11 - Log of Test Boring No. 9

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
				Boring #9, con't.		
30	9-7		10	Silty CLAY w/fine SAND, stiff, wet (CL)	104.3	22.5
35	9-8		23	(at 35', very stiff)	107.1	22.1
40	9-9		25	Silty CLAY, tan/brown, very stiff, moist (CL)	111.3	19.3
45	9-10		7	Clayey SAND, brown, loose, wet (SC)	111.1	21.2
50	9-11		15	Sandy SILT, brown, stiff, moist (SM)	115.4	16.9
				Boring Terminated at 51.0 ft. Groundwater Encountered at 13.0 ft. Date Drilled: 1 Sept. 1977		

Figure 11- Log of Test Boring No. 9 (cont)

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
				Ground Surface at 10.0 ft.		
0				Roadbase		
				Sandy SILT w/gravel, brown, damp (SM)		
	10-1		13	Clayey SAND w/silty clay lenses, grey/ brown, stiff, moist (SC/CL)	99.5	18.5
5	10-2		9	Mixed Clayey SAND-Silty CLAY, brown/orange, stiff, moist (SC-CL)	100.5	11.0
				Silty CLAY, w/traces of very fine sand, dark brownish grey, soft to medium stiff, moist (CL)		
10	10-3		4		-	-
				▼ 1530; 6 Sept. '77		
15	10-4		6	Silty CLAY w/trace of sand, mottled grey/ brown, medium stiff (CL)	-	-
20	10-5		5	(at 20.5' grading to orange/brown)	-	-
25	10-6		15	Silty CLAY w/trace of sand, tan/brown/ grey, stiff, moist (CL)	113.8	17.8
				Boring Terminated at 26.0 ft. Groundwater Encountered at 13.5 ft. Date Drilled: 6 Sept. 1977		
30						

Figure 13 - Log of Test Boring No. 19 .

30th November, 1977

DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 9.5 ft.		
				Roadbase		
				Sandy SILT w/gravel, brown, moist (SM)		
			4/6"	Silty CLAY w/trace sand, organics, medium	100.0	23.8
	11-1		6/6"	stiff (CL)		
				Silty CLAY, mottled tan/brown, stiff, wet (CL)		
5	11-2		7	Silty CLAY, grey/black, medium stiff, wet (CL)	99.7	22.5
10	11-3		5		96.0	24.0
				▼ 1010; 7 Sept. '77		
15			9		98.5	24.2
	11-4			Silty CLAY, mottled grey/tan/brown, stiff, wet (CL)	106.1	22.9
				Clayey SAND w/clay nodules & organics, mottled tan/brown, loose, wet (SC)		
20	11-5		4/6"		99.7	23.1
			5/6"	Mixed Clayey SAND/med. sand, grey/tan-brown, loose, wet (SC-SP)	102.5	22.3
				Silty SAND, grey/brown, loose, wet (SM)		
				Silty CLAY w/occ. gravel, grey, wet (CL)		
				GRAVEL-SILT-SAND mixture, grey, loose, wet (GM)		
25	11-6		5/6"	Silty CLAY, mottled tan/brown, stiff,		
			6/6"	moist (CL)	112.7	18.6
				Boring Terminated at 26.0 ft.		
				Groundwater Encountered at 13.5 ft.		
				Date Drilled: 7 Sept. 1977		
30						

Figure 13 - Log of Test Boring No. 11

File: 1/77087/1

30th November, 1977

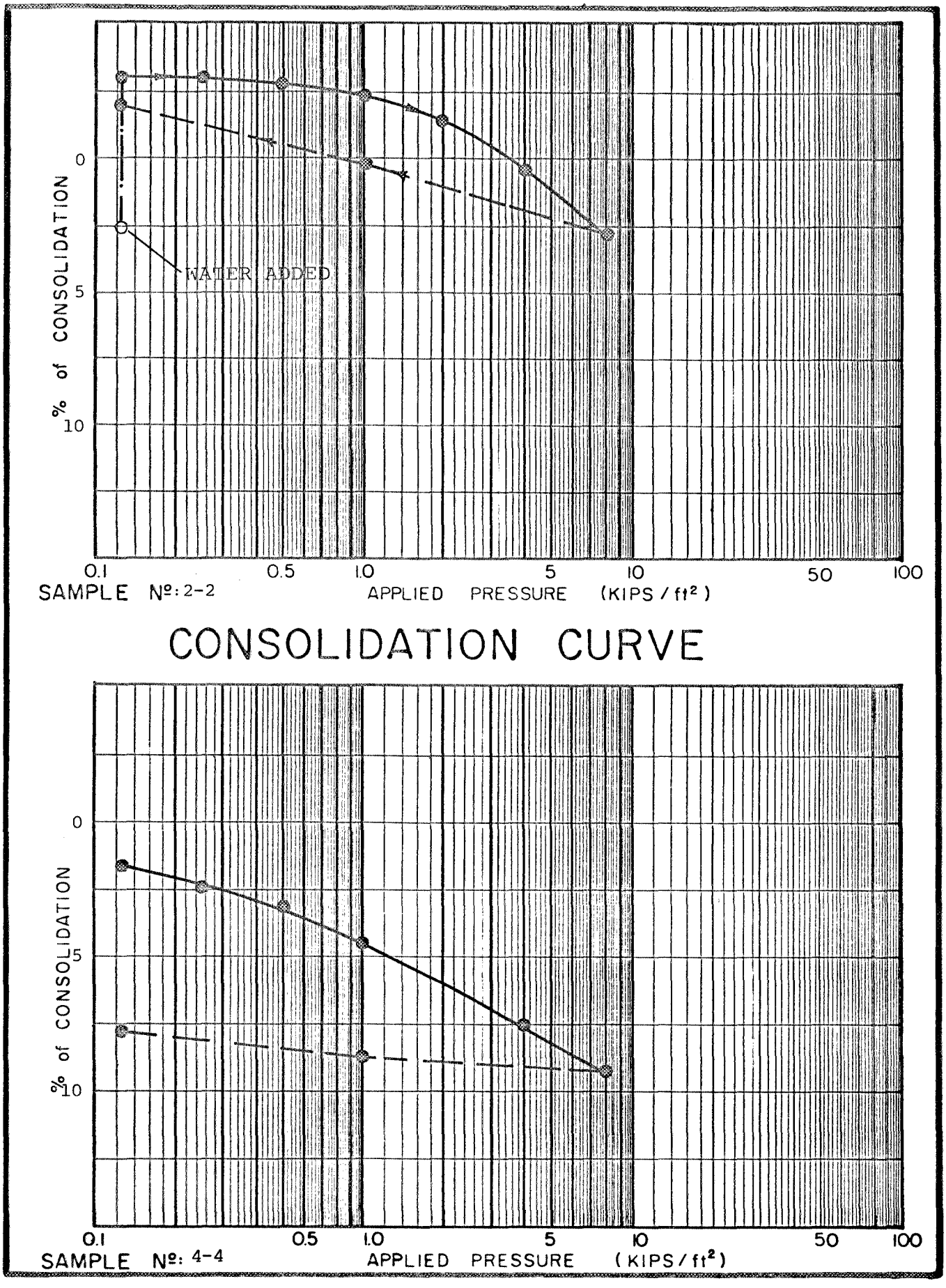
DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY p.c.f	IN-PLACE MOISTURE CONTENT % dry wt
				Ground Surface at 13.0 ft.		
0				SAND-SILT mixture w/GRAVEL, brown, damp (SM)		
	12-1		4	Mixed Silty SAND/Silty CLAY/Sandy SILT, rust flecking, tan/brown, loose, moist (SM - CL)	88.9	17.3
5	12-2		5	Silty CLAY w/trace of sand, heavy organics, mottled brown/black, medium stiff (CL)	-	-
10	12-3		6	(at 10.5', mottled grey/black in color)	91.3	28.6
				Sandy CLAY, brown, moist (CL)		
15	12-4		10	Silty CLAY w/trace of sand, organics, grey/black, stiff, wet (CL) ▽ 1330; 23 Sept. '77	96.9	28.4
20	12-5		14	(at 20.5' mottled tan/grey in color)	100.2	28.0
				Clayey SAND, mottled tan/brown, loose, wet (SC)		
25	12-6		5		102.6	23.4
				Boring Terminated at 26.0 ft. Groundwater Encountered at 16.5 ft. Date Drilled: 23 Sept. 1977		
30						

Figure 14 - Log of Test Boring No. 12

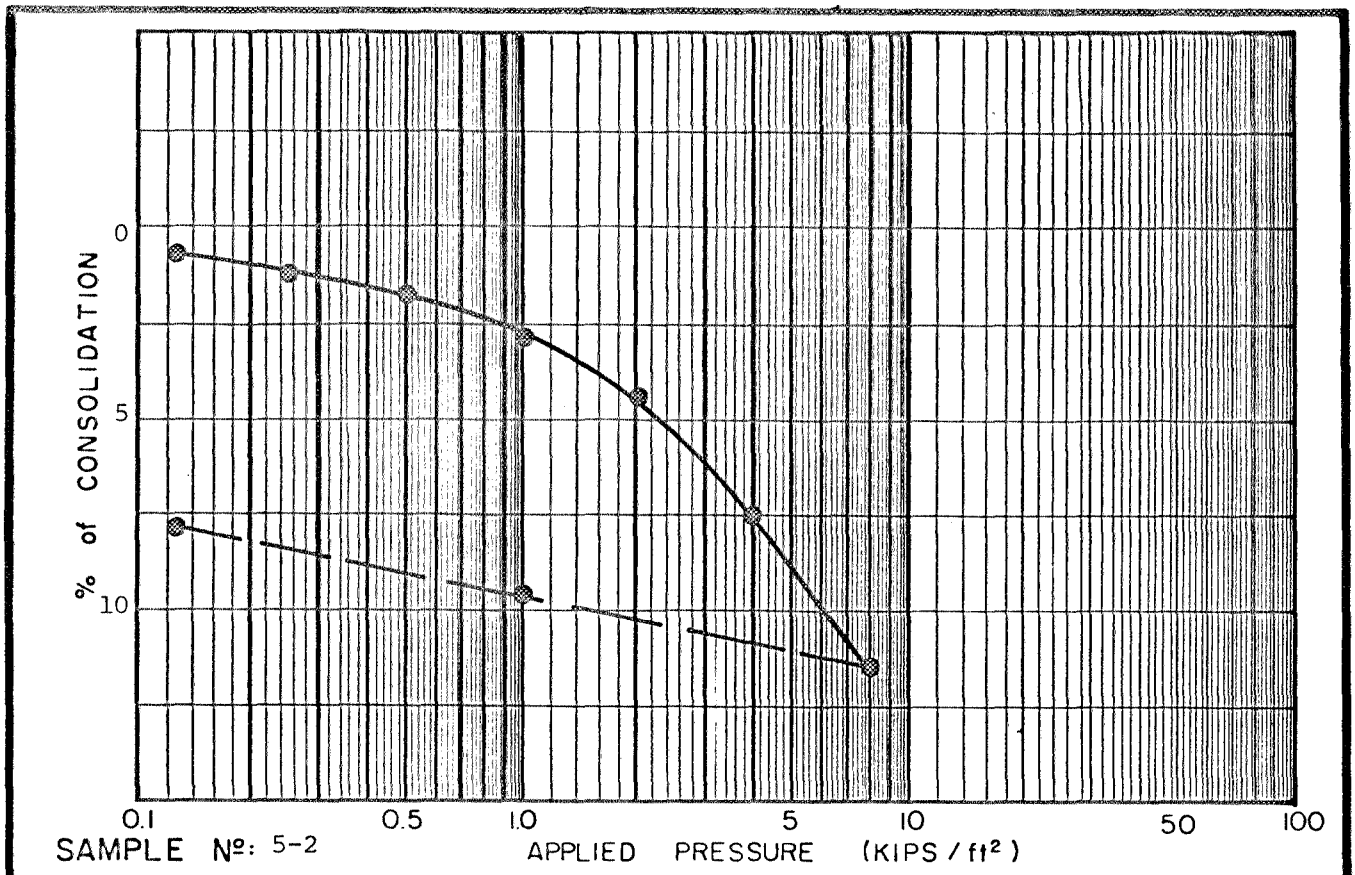
DEPTH IN FEET	SAMPLE NO.	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE DRY DENSITY pcf	IN-PLACE MOISTURE CONTENT % dry wt
0				Ground Surface at 12.0 ft.		
				Silty CLAY/trace of sand, tan/brown, damp (CL)		
	13-1		4	Silty CLAY, rust flecking, organics, black/tan, soft, wet (CL)	88.3	25.3
5	13-2		5	(at 5.5', mottled grey/tan, stiff)	85.4	29.4
				Silty CLAY, rust flecking, organics, grey/black, medium stiff (CL)		
10	13-3		5/6"	Mixed Silty CLAY-Clayey SAND, brown, stiff, wet (CL-SC)	102.1	21.9
			6/6"	Silty CLAY w/Sand, rust flecking, mottled tan/brown, stiff, moist (CL)	112.1	15.9
15	13-4		7	▽ 1100; 23 Sept. '77 Silty CLAY, organics, mottled grey/black, medium stiff, wet (CL)	89.3	30.8
20	13-5		12	Silty CLAY, rust flecking, mottled tan/grey, stiff, wet (CL)	118.5	30.1
25	13-6		7	Silty CLAY w/very fine sand and organics, mottled red/brown, medium stiff, wet (CL)	103.0	21.7
30				Boring Terminated at 26.0 ft. Groundwater Encountered at 15.0 ft. Date Drilled: 23 Sept. 1977		

Figure 15 - Log of Test Boring No. 13

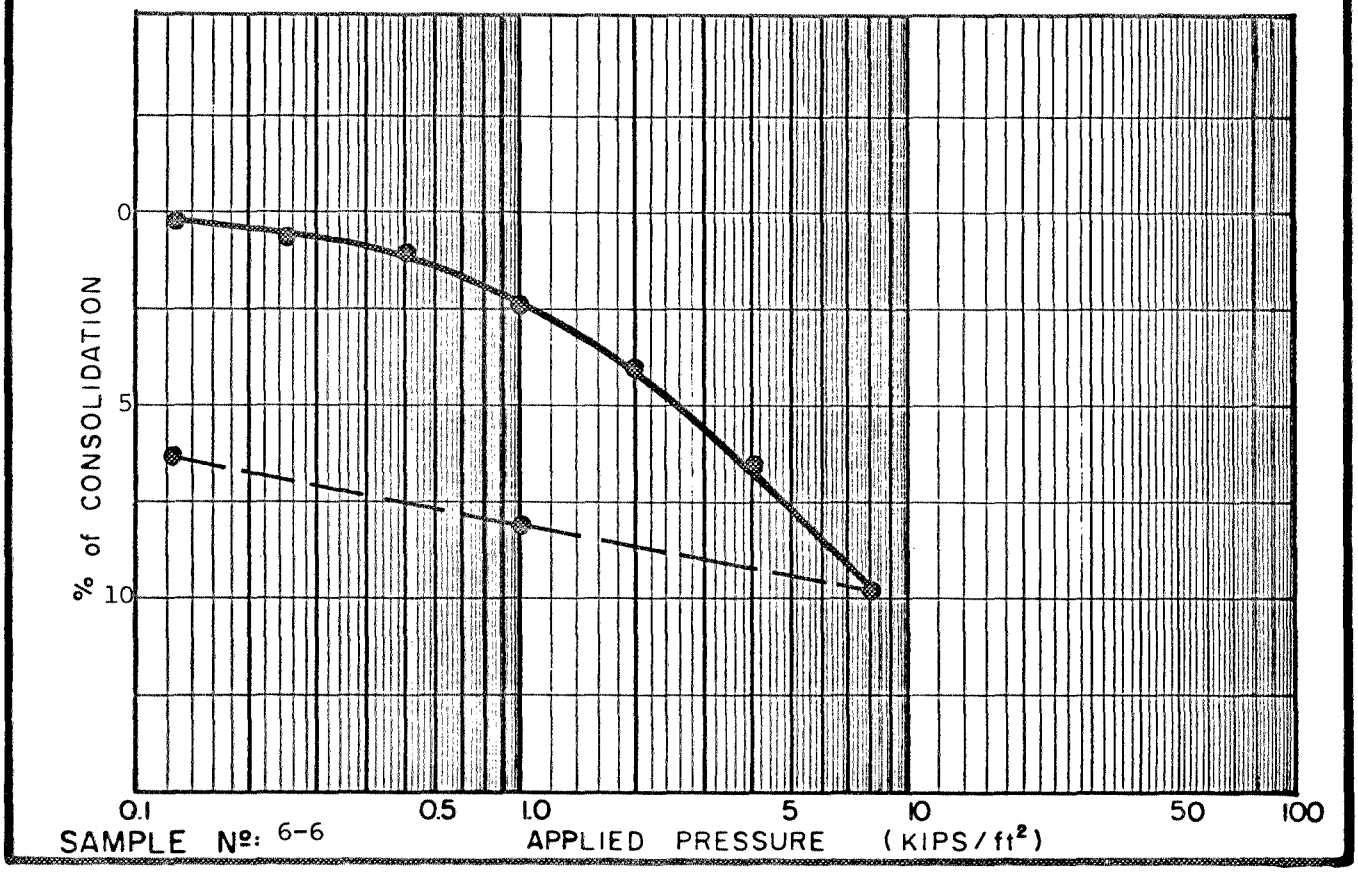
File: 1/7708//1
30th November, 1977



CONSOLIDATION CURVE



CONSOLIDATION CURVE

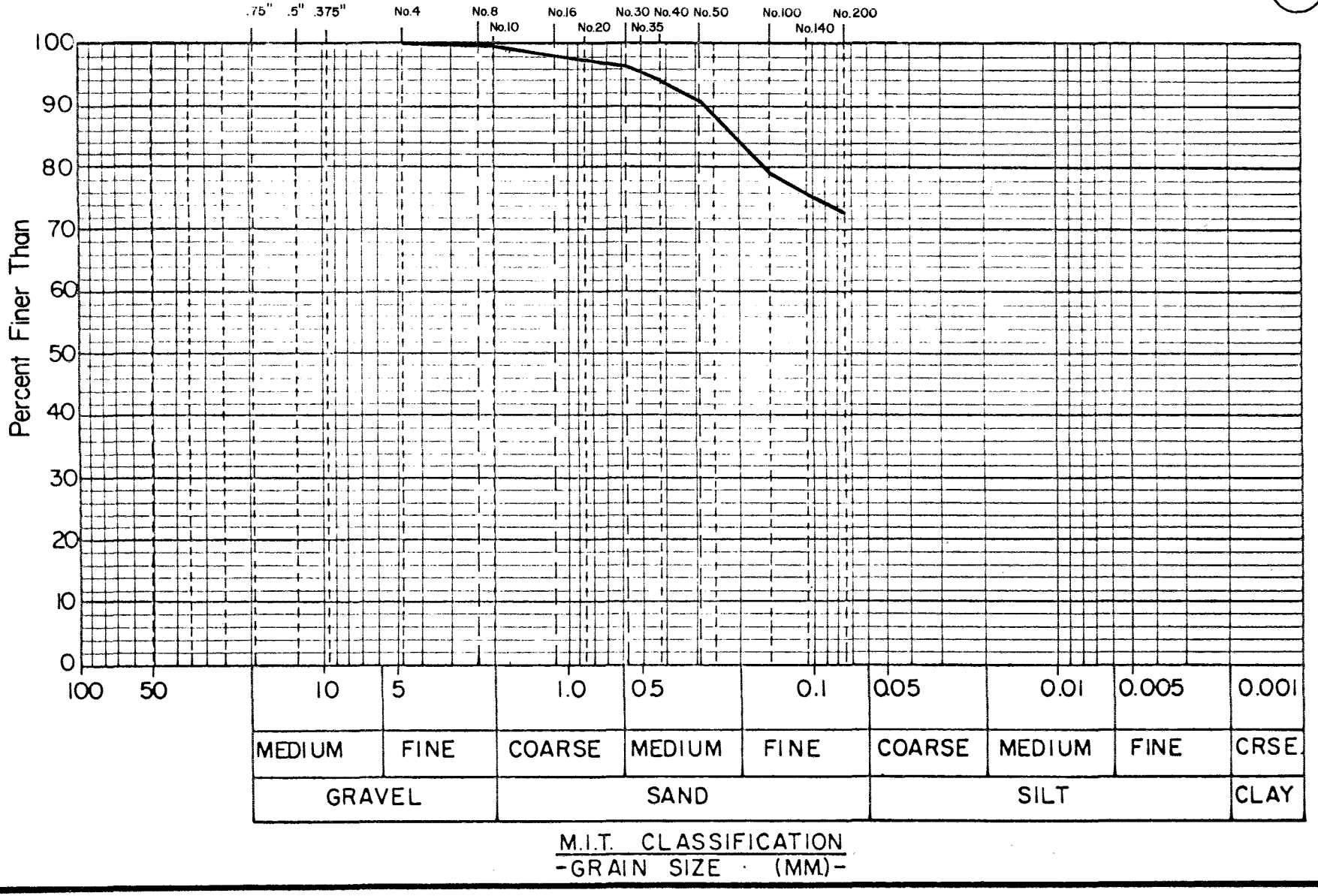


Sample No: 1-7

Description: Silty CLAY w/siltstone and slight sand

GRAVEL	0.0
SAND	19
SILT	81
CLAY	

5



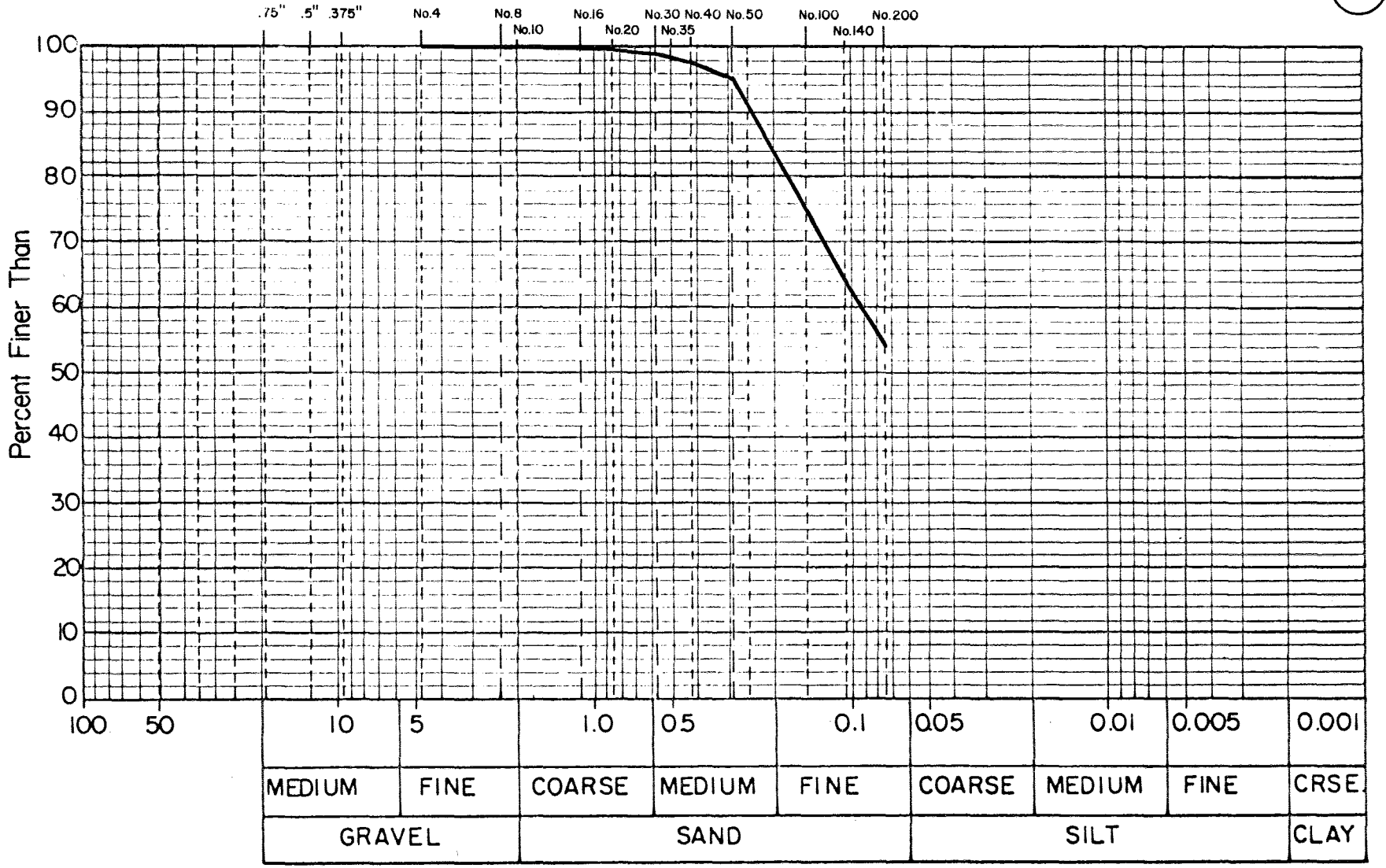
M.I.T. CLASSIFICATION
-GRAIN SIZE · (MM)-

Sample No: 1-9

Description: Fine sandy CLAY w/a coarse sand lense

GRAVEL	0
SAND	40
SILT	- 60
CLAY	/

J



M.I.T. CLASSIFICATION
-GRAIN SIZE (MM)-

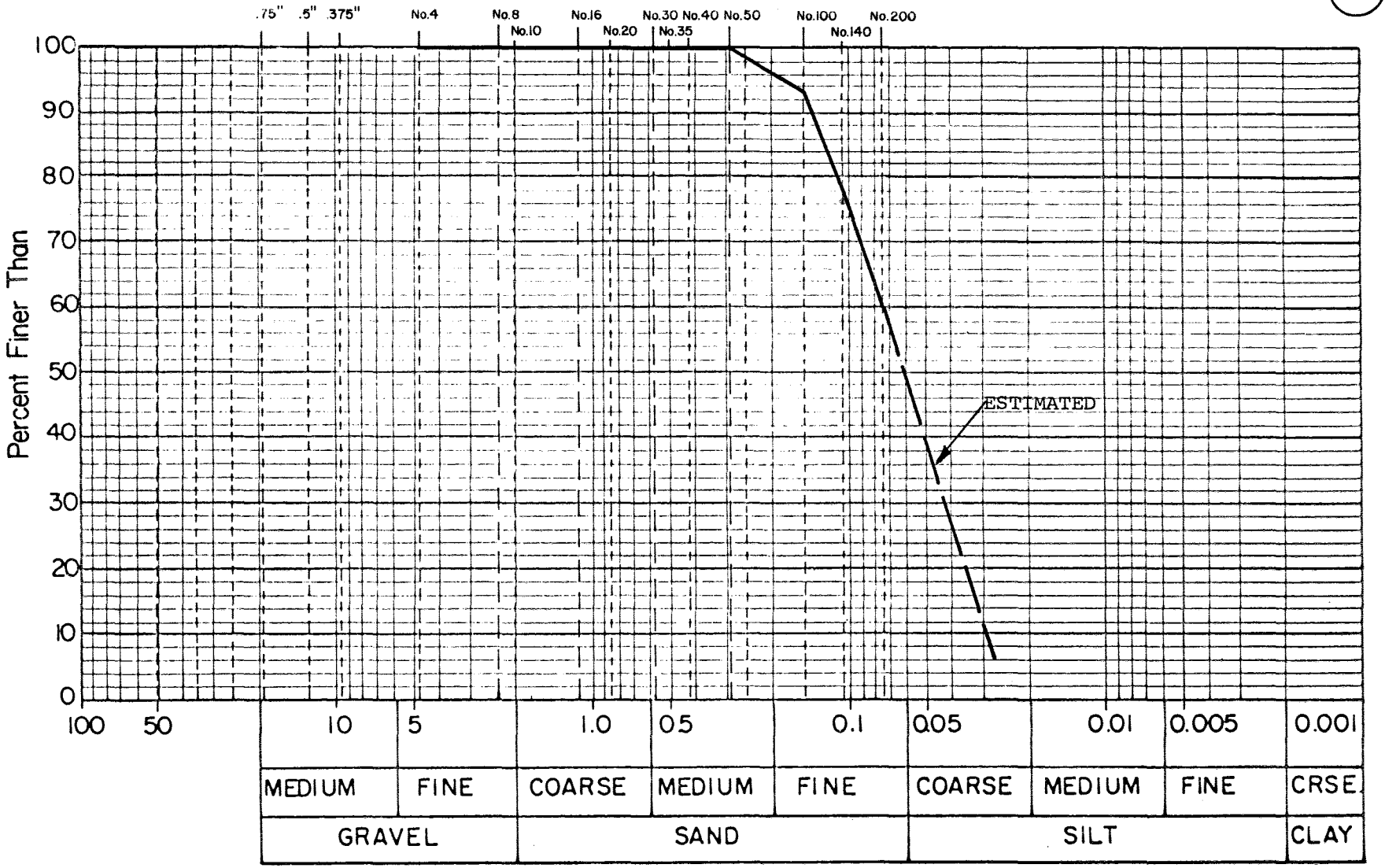
30th November, 1977

Sample No: 3-5

Description: Very fine Sandy SILT

GRAVEL	-
SAND	42
SILT	— 58
CLAY	/

5



M.I.T. CLASSIFICATION
-GRAIN SIZE · (MM)-

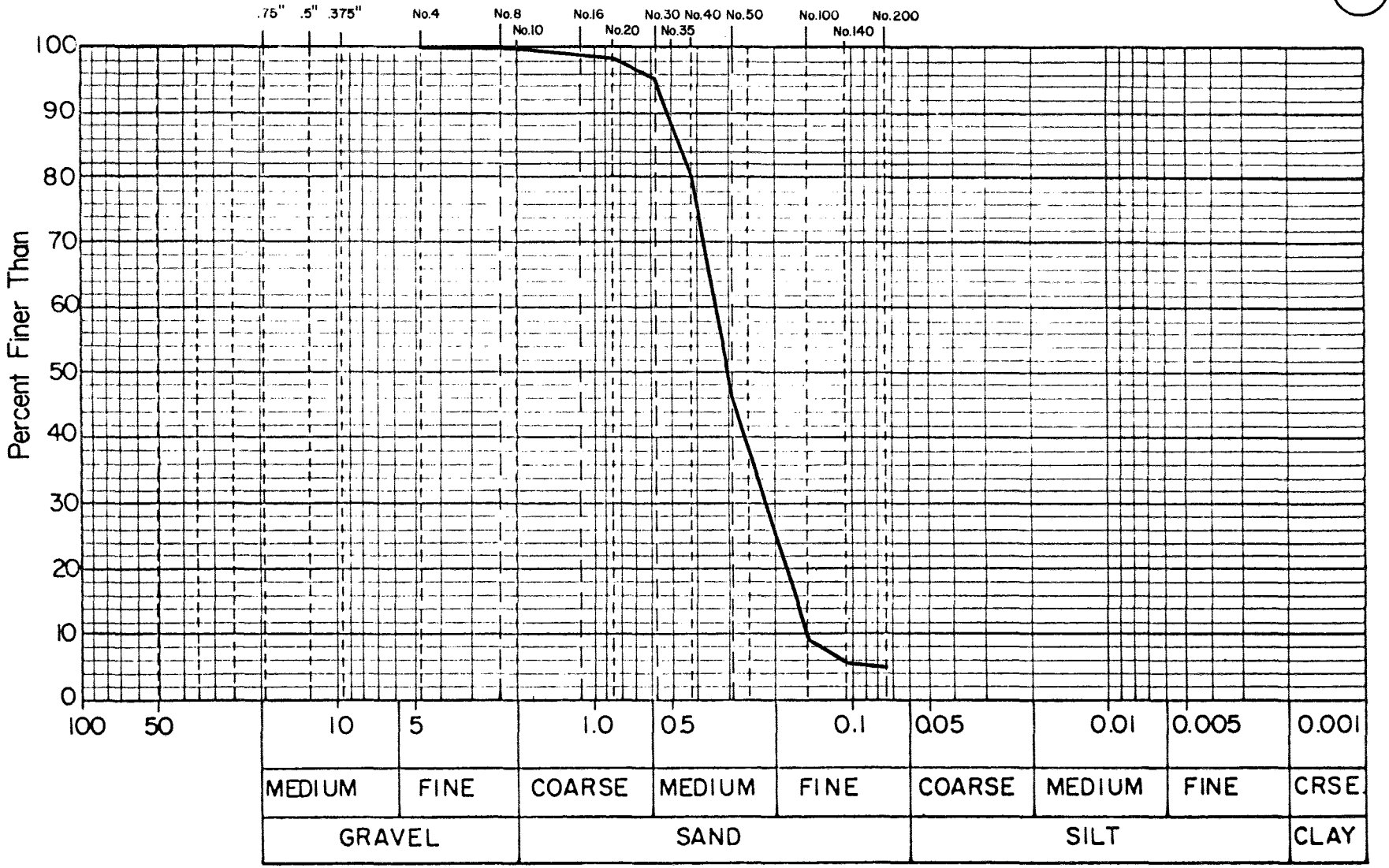
File: T/////
30th November, 1977

Sample No: 706

Description: Med. SAND w/slight binder

GRAVEL	.4
SAND	95.1
SILT	— 4.5
CLAY	/

J



M.I.T. CLASSIFICATION
-GRAIN SIZE · (MM.)-

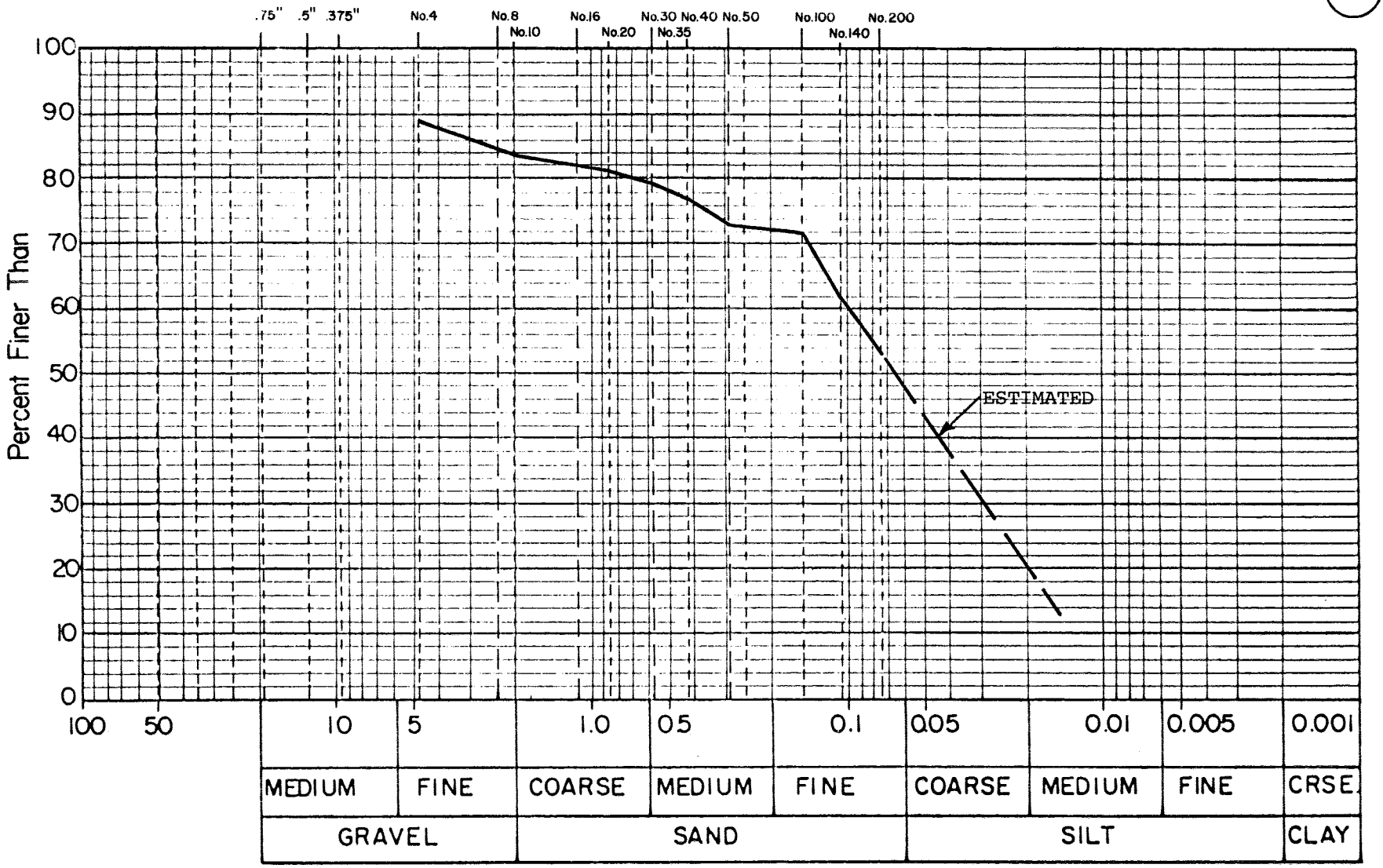
Date: 4/1/0017
30th November, 1977

Sample No: 9-10

Description: Clayey SAND w/small rounded gravel

GRAVEL	11.2
SAND	35.8
SILT	— 53
CLAY	/

J



M.I.T. CLASSIFICATION
-GRAIN SIZE (MM)-

File: 1/77087/1
30th November, 1977

COMPACTION TEST

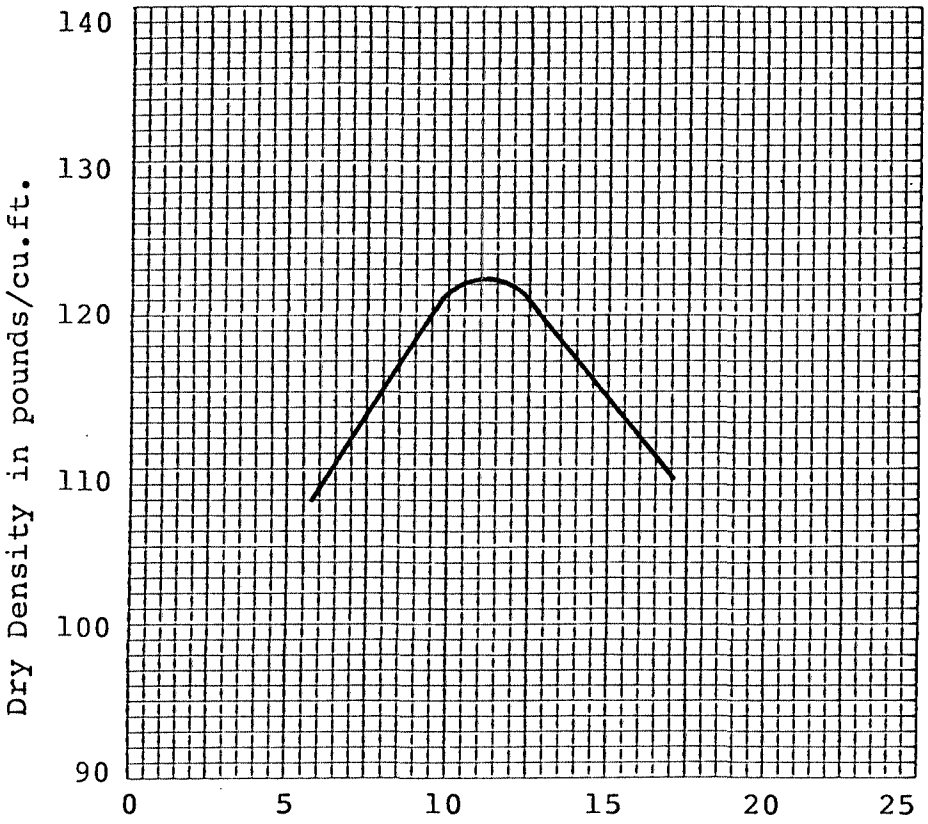
Sample Number Bag A

Soil Description Silty CLAY w/sand and gravel, brown

Compaction Method

__ ASTM D698 __ Calif. 216

_X_ ASTM D1557 __ Other _____



Moisture Content in percent dry weight

Maximum Dry Density 122.5 p.c.f

Optimum Moisture Content 11.2 % dry weight

File: 1/7708/1
30th November, 1977

COMPACTION TEST

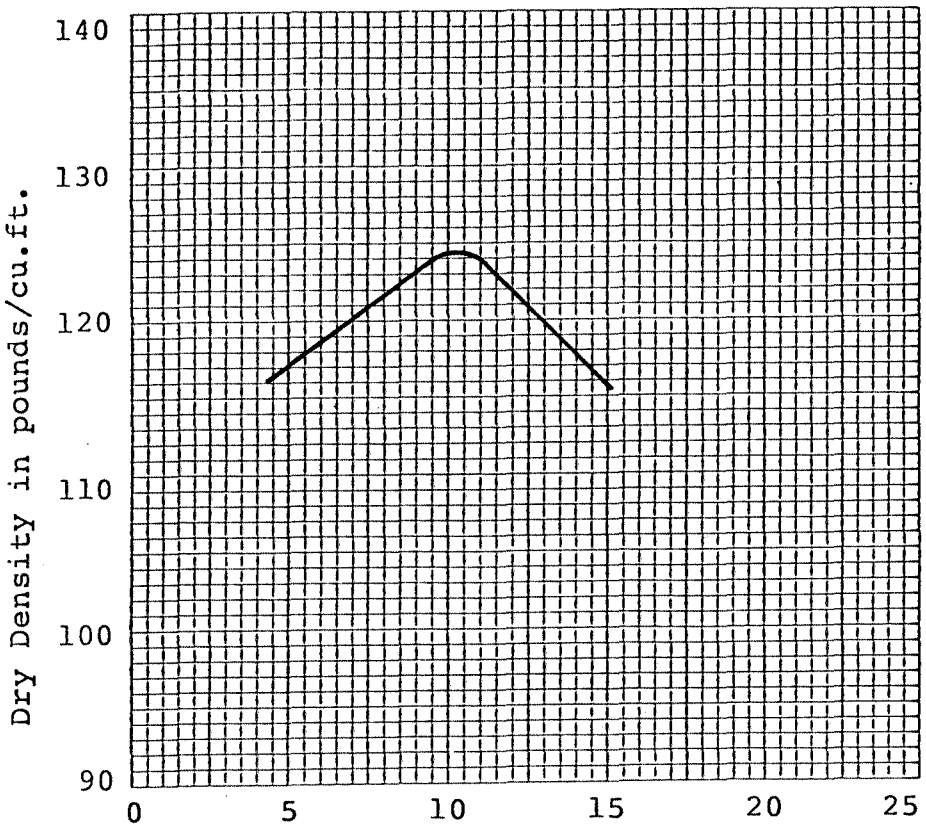
Sample Number Bag D

Soil Description Sandy CLAY w/gravel, brown

Compaction Method

__ ASTM D698 __ Calif. 216

X ASTM D1557 __ Other _____



Moisture Content in percent dry weight

Maximum Dry Density 124.5 p.c.f

Optimum Moisture Content 10.4 % dry weight

File: 1/77067/1
30th November, 1977

COMPACTION TEST

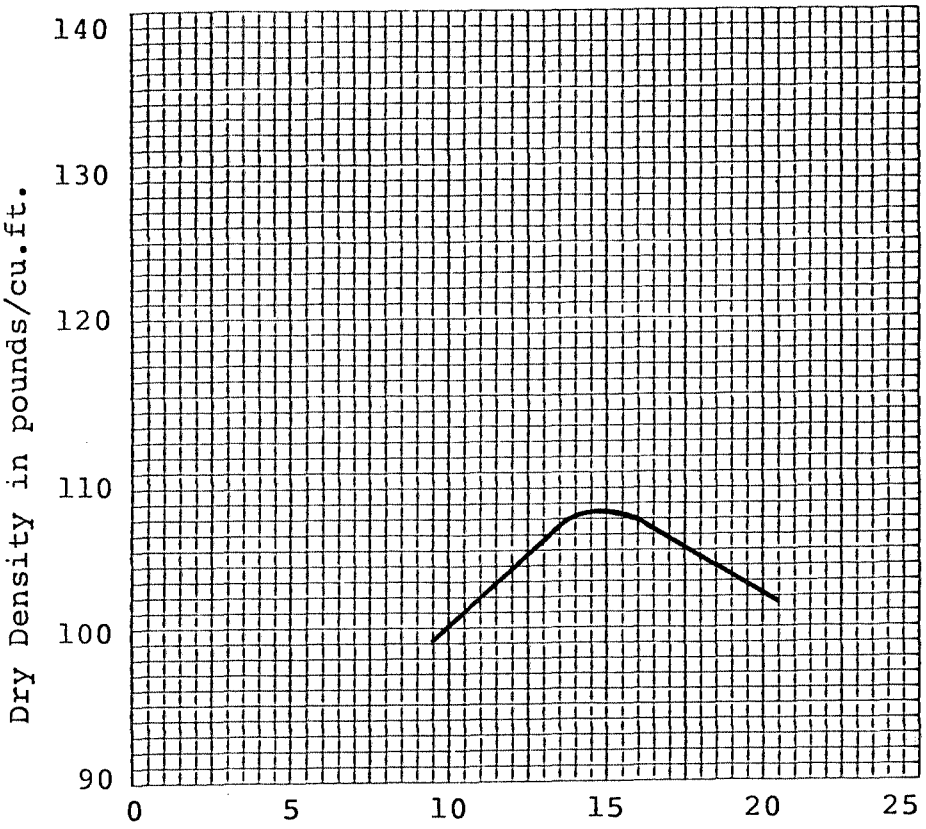
Sample Number Bag F

Soil Description Sandy, SILT w/ organics, brown

Compaction Method

__ ASTM D698 __ Calif. 216

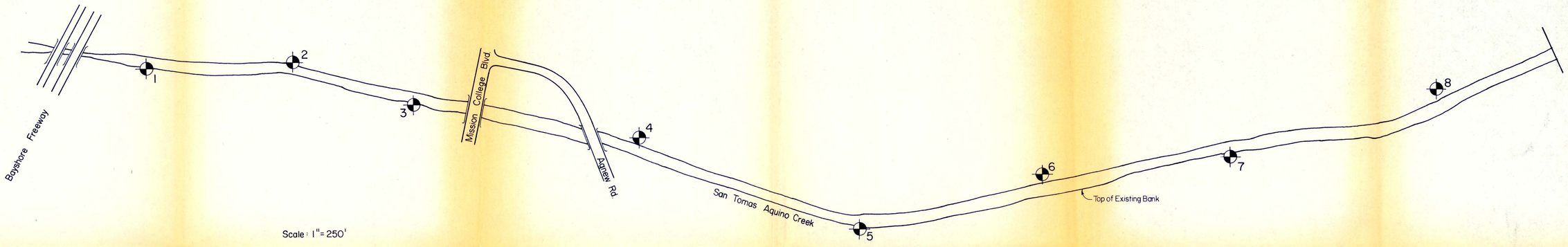
X ASTM D1557 __ Other _____



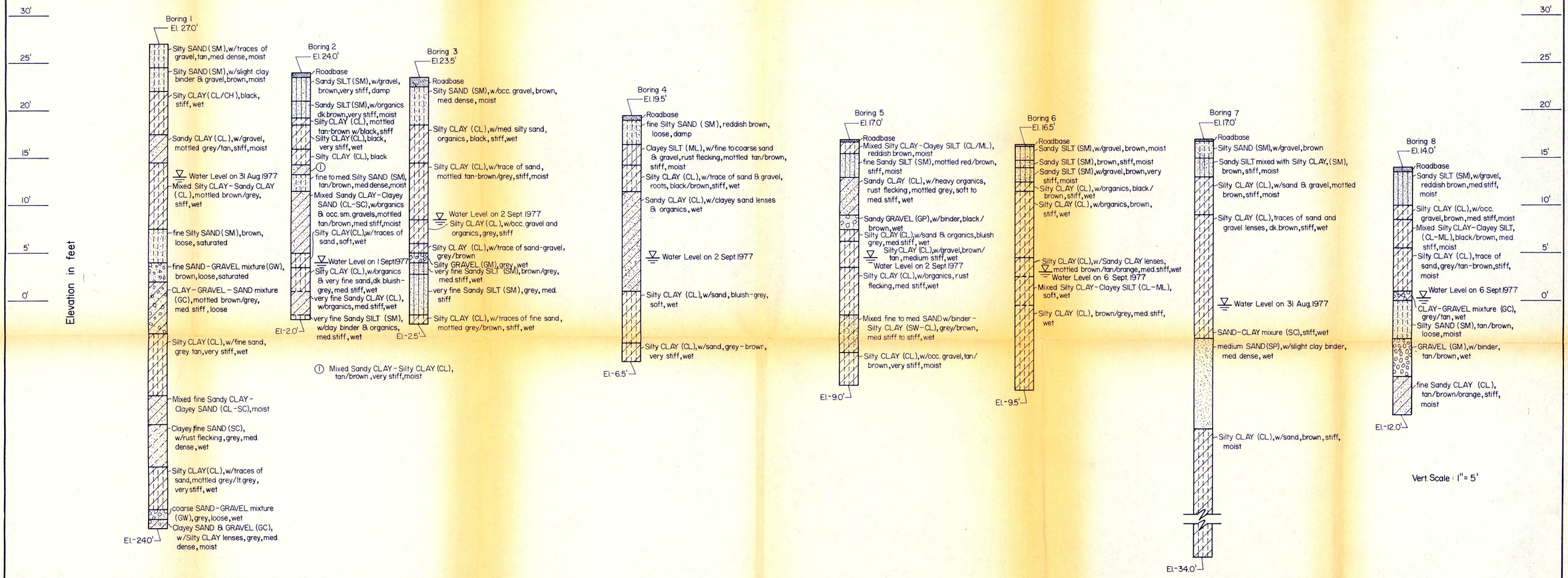
Moisture Content in percent dry weight

Maximum Dry Density 108.7 p.c.f

Optimum Moisture Content 15.0 % dry weight



Scale : 1"= 250'



REFER TO TRACING FOR LATEST REVISION			
REV.	DESCRIPTION	SUB.	APPR.

REFERENCE INFORMATION AND NOTES

Data shown on subsurface soil profiles obtained from Logs of Borings, Figures 3 through 10, of this report

DATE
DESIGN
DRAWN
CHECKED

Santa Clara Valley Water District

ENGINEERING CERTIFICATION
PROJECT ENGINEER
DIVISION ENGINEER R.C.E. NO. 15851

ENGINEERING APPROVAL
HEAD, DESIGN BRANCH R.C.E. NO. 14455

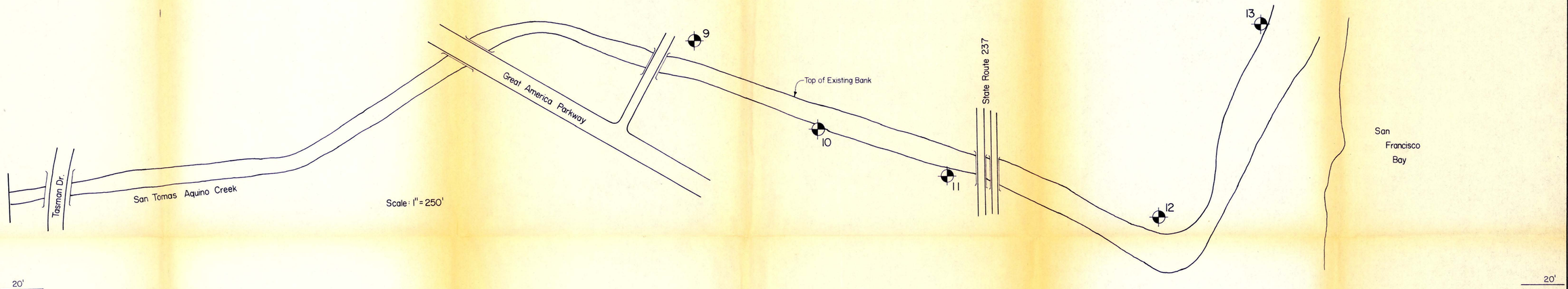
William F. Jones, Inc. • Consulting Engineers
1156 Snowberry Ct
Sunnyvale, CA 94087, Ph. 245-0521/347-3826

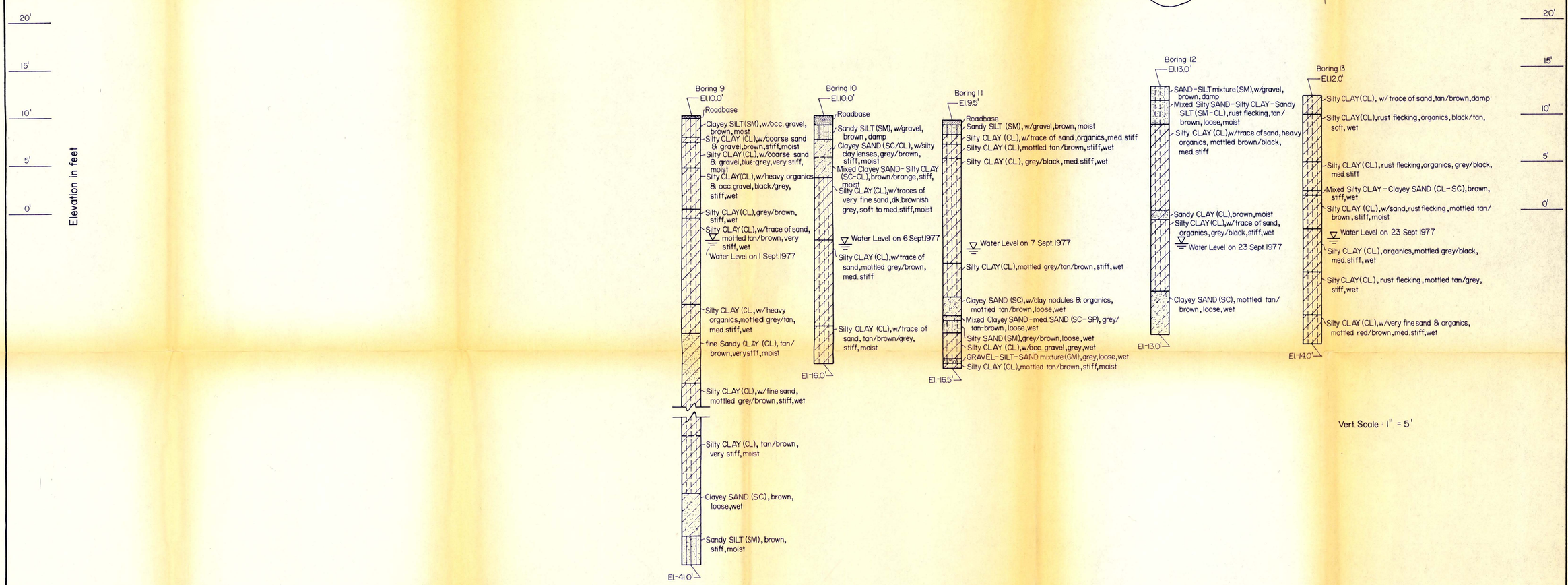
Job No. 1/77087/1
Figure No. 1

SCALE as shown
SHEET

San Tomas Aquino Creek Improvements

Site Plan and Locations of Test Borings





REFER TO TRACING FOR LATEST REVISION			
REV.	DESCRIPTION	SUB.	APPR.

REFERENCE INFORMATION AND NOTES

Data shown on subsurface soil profiles obtained from Logs of Borings, Figures 11 through 15, of this report

DATE
DESIGN
DRAWN
CHECKED

Santa Clara Valley Water District

ENGINEERING CERTIFICATION
PROJECT ENGINEER
DIVISION ENGINEER R.C.E. NO. 15851

ENGINEERING APPROVAL
HEAD, DESIGN BRANCH R.C.E. NO. 14455

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Sunnyvale, CA 94087, Ph 245-0521/ 347-3826

Job No. 1/77087/1
Figure No. 2

SCALE as shown
SHEET

San Tomas Aquino Creek Improvements

Site Plan and Location of Test Borings